

# STUDIES IN PHORMIACEAE (LILIACEAE) 1: NEW SPECIES AND COMBINATIONS IN *DIANELLA* Lam. ex Juss.

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## ABSTRACT

Carr, G.W. and Horsfall, P.H. Studies in Phormiaceae (Liliaceae) 1: New species and combinations in *Dianella* Lam. ex Juss. *Muelleria* 8:(3): 365–378 (1995). — Three new species of *Dianella* (Phormiaceae/Liliaceae) are described: *D. callicarpa* G.W.Carr and P.F.Horsfall from Victoria, *D. amoena* G.W.Carr and P.F.Horsfall from Victoria and Tasmania, and *D. tarda* P.F.Horsfall and G.W.Carr from Victoria and New South Wales. The new names and combinations, *Dianella brevicaulis* (Ostenf.) G.W.Carr and P.F.Horsfall and *Dianella porracea* (R.Henderson) P.F.Horsfall and G.W.Carr, are effected.

## INTRODUCTION

Recent regional accounts of *Dianella* Lam. ex Juss. for South Australia (Jessop and Henderson 1986), New South Wales (Wilson 1993) and Victoria (Conran 1994) are largely based on the *Flora of Australia* treatment by Henderson (1987). The genus however is poorly studied, as acknowledged by Henderson (1987), Wilson (1993) and Conran (1994), and this is particularly evident when attempting to apply names to both fresh and dry material using this literature.

The taxa recognised by Henderson (1987) in *Flora of Australia*, including many new species and varieties described therein, are poorly circumscribed because of the imposed brevity of the *Flora of Australia* accounts. Furthermore, dried material of this genus is extremely difficult to work with, as many taxonomically valuable characters are lost or damaged on drying; for example the way the leaves are held, leaf colour and shape in cross section, time flowers open, perianth colour, anther and strumae colour and shape, and floral fragrance. Most dried material is also incomplete, particularly in representation of roots and rhizomes, partly because of the large size of many *Dianella* plants; furthermore almost all collections we have examined in Australian herbaria lack flowers or possess flowers that are damaged or poorly pressed.

Study of living *Dianella* material is essential (Green 1994), and our studies of living material in recent years have shown the taxonomic utility of character states hitherto overlooked or unavailable to previous workers on *Dianella*. These may be useful alone or (more usually) in combination and there is much less morphological variation within *Dianella* taxa than generally credited. Continuous variation in vegetative characters is common in relatively few taxa, and where morphological discontinuities occur in combination, the existence of additional taxa can often be demonstrated. These morphological discontinuities are often also correlated with environmental (i.e. ecological) parameters.

We have observed by cultivation of multiple collections of numerous taxa, that most morphological and chemical (colour and floral fragrance) characters are constant. Our field and laboratory studies of Australian *Dianella* in recent years show the existence of undescribed species, and that some infraspecific entities warrant recognition at higher rank, as recognised by Curtis (1952) and acknowledged by Henderson (1987). We describe here 3 new species from south-eastern Australia and elevate 2 entities to specific rank.

Nomenclature for plant parts generally follows Henderson (1987), and the colour of the organs, are of crucial relevance in *Dianella* taxonomy, is given where possible according to the Royal Horticultural Society Colour Chart, Royal Horticultural Society, London and Flower Council of Holland, Leiden (no date).

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## TAXONOMY

***Dianella callicarpa* G.W.Carr et P.F.Horsfall, sp. nov.**

Herba perennans, caespitosa dense ad longi-rhizomatosam. Folia ad 160 cm longa, 2 cm lata, tenuia, lorata, atrovirentia, subnitida; vaginae oclusae partim vel perfecte, in sectione transversali plus minusve biconvexae. Inflorescentia ad 190 cm clatum, elegans; flores fragrant leniter, perianthium caeruleo-violaceum, tepala tenuia; strumae staminales atro-aurantiacae, antherae luteolae. Fructus purpuratus vividus.

**TYPUS:** Victoria-cultivated in Melbourne garden of G.W.Carr, ex Victorian Volcanic Plain, south of Branhholme, Victorian plant grid D50, 2 Nov. 1991, *G.W.Carr* 11643 (**HOLOTYPE:** MEL; **ISOTYPE:** MEL, HO, AD, NSW, K).

Loosely rhizomic to densely caespitose evergreen perennial herb to 190 cm high and 1.5 m diameter at the base, shoots touching to c. 15 cm apart; roots fibrous, not fleshy, yellow, (nearest Greyed-Orange Group 163B); rhizomes up to 20 cm long by 6–10 mm diam, yellow, (nearest Yellow Group 6C); stems of shoots 10–80 mm long by 7–8 mm diam. *Leaves* lorate, gradually tapering to the apex, 33–160 cm long by 8–20 mm wide,  $\pm$  flat or weakly revolute, mid to dark green, (nearest Yellow-Green Group 147A), slightly discolourous, lamina smooth and glossy, minutely and irregularly scabrous along margins and abaxial midrib, most pronounced on midrib below leaf apex. *Leaf sheaths* equitant, fan-shaped, tightly clasping, biconvex in cross section,  $\frac{1}{4}$ – $\frac{4}{5}$  occluded near summit of sheath, weakly to strongly marked with dull crimson at the base (nearest Greyed-Red Group 182A), especially on the veins. *Inflorescence* tall,  $\pm$  erect, 60–190 cm long, scape slender, arching; panicle 25–50 cm long,  $\pm$  narrow-conical in outline, branches widely spreading, relatively short, regularly spaced; cymules 2–12 flowered, pedicels strongly recurved, 3–11 mm long. *Flowers* nodding, medium sized, weakly but sweetly fragrant, opening early to mid morning, collapsing late afternoon; perianth segments blue-violet suffused with dull crimson (nearest Blue-Violet Group 93D); outer tepals somewhat discolourous, strongly marked with dull crimson abaxially (nearest Red-Purple Group 72A or Greyed-Red Group 182B), adaxially paler, (Violet Group 185B); segments strongly and equally recurved; broadly lanceolate to narrow ovate-lanceolate, subacute, 7–9 mm long by 3–4 mm wide, 5-veined; inner tepals (Blue-Violet Group 97A), broadly ovate, shallowly emarginate, 6.5–8 mm long by 3.5–4.5 mm wide, 5-veined. Stamens 6 mm long; filaments 2.5 mm long (straightened) by 0.75 mm wide, strongly sigmoid, dark blue-violet at the base, becoming white distally,  $\pm$  translucent; strumae compressed globose-cuneate,  $\pm$  hexagonal in section, minutely papillose, deep orange-yellow (nearest Yellow-Orange Group 23A or Orange Group 24A); anthers dirty pale yellow, (nearest Yellow Group 10A), much darker in the lateral grooves and around the base, dorsally the darker colour extends to the apical pores; 3.5–4 mm long by 1 mm wide, very narrowly cuneate-lanceolate. Style very pale blue-violet, just exceeding the anthers, 6 mm long; ovary green, 3-locular,  $\pm$  globular, 1.25 mm long by 1.5 mm wide; ovules 8 per loculus. *Fruit* globose to obovoid,  $\pm$  lumpy, deep blue-purple, glossy, 6–15 mm long. *Seeds* globose-lenticular, slightly angular, completely smooth, black, very shiny, 3 mm long by 2 mm wide.

## ETYMOLOGY

From the Greek, *calli* - beautiful and *carpus* - fruit in reference to the abundant, brilliant, deep purple fruits on a graceful infructescence.

## OTHER SPECIMENS EXAMINED

*Victoria* - Type locality, 2 Nov. 1991, *P.F.Horsfall and G.W.Carr* 11644 (MEL). Near Lake Condah, 19 Jan. 1992, *G.W.Carr* 11695 (MEL). 6.5 miles NE of Dergholm, along McPherson Creek, 8 Dec. 1971, *A.C.Beauglehole* 38033 (MEL 534272). W side of Victoria Range, between Glenisla and Billywing, swamp near road, 4 Mar. 1957, *A.C.Beauglehole* 4633 (MEL 534260). Wannon River, Diprose Bridge, 9 km SW of Cavendish P.O., SW Study Area (D33), 5 Feb. 1978, *A.C.Beauglehole* 57715 (MEL 1602519). 3 km NW of Bessie Belle, SW Study Area (E6), 12 Dec. 1979, *A.C.Beauglehole* 67235 (MEL 1597878).



Fig. 1. *Dianella callicarpa*. a — habit  $\times 0.13$ , b — flower  $\times 2$ , c — outer tepal  $\times 2$ , d — inner tepal  $\times 2$ , e — anther adaxial — abaxial  $\times 4$ , f — fruit  $\times 1$ , g — seed  $\times 4$ , h — section through mid leaf lamina  $\times 4$ , i — cross section mid leaf sheath  $\times 4$ .



## DISTRIBUTION AND CONSERVATION STATUS

*Dianella callicarpa* was first collected (as *D. tasmanica* J.D.Hook.) by A.C.Beauhole (MEL) in south-west Victoria. It was recognised as an undescribed species by the authors at the type locality (2 populations) near Branhholme, and a very small population was found subsequently near Lake Condah during a vegetation survey (Carr *et al.* 1993). Further populations were found south-west of the Condah Mission in 1993 (Carr unpublished), and at Halls Gap in the Grampians (Horsfall unpublished). Scattered roadside populations were found in 1993, 2–3 km south of Myamyn, on the east side of the Henty Highway between Hamilton and Portland, also in the Branhholme — Condah area (Horsfall unpublished). The southernmost collection was made by M.Trengrove (pers. comm.) at Hopkins Falls near Warnambool. Although less than 10 populations are known to us, the range of habitat it occupies suggest that *D. callicarpa* may be much more widespread in southern and western Victoria and probably occurs, or occurred, in south-east South Australia. The species also occurs on the Mornington Peninsula at Crib Point (Horsfall unpublished) and in the Dandenong Ranges east of Melbourne (R.Robinson pers.comm.). All populations known to us are small, with the largest (near Condah Mission) containing about 30 plants. Further searches will undoubtedly reveal more populations in south-west Victoria, but habitat has been much depleted for agriculture and exotic forestry. The risk rating according to the code of Briggs and Leigh (1989) is 3e, that is with a current geographic range greater than 100 km, vulnerable in the long term, and inadequately reserved.

The major threats to *D. callicarpa* are environmental weed invasions as discussed by Carr *et al.* (1993) in connection with Lake Condah reserve vegetation. At the type locality *Rubus bicolor* (see Ross 1993 for taxonomic authorities) and bird dispersed populations of *Pittosporum undulatum*, *Euonymus* sp. and *Rosa* sp. threaten the species. Near Condah, populations on farm land and in forest are heavily grazed by cattle.

## HABITAT AND ECOLOGY

At the type locality *D. callicarpa* occurs in remnant *Leptospermum lanigerum* scrub on seasonally inundated, permanently moist or waterlogged, dark peaty Quaternary sediments derived from basalt. The site is very shaded. Associated species include *Leucopogon lanceolata* and *Gahnia clarkei*. A similar, substantially cleared, weed-invaded habitat is occupied near Lake Condah. The species also occurs on a very dry stony rise (Carr *et al.* 1993) dominated by *Eucalyptus viminalis*. To the south-east near Condah Mission, *D. callicarpa* occurs on moist loams of drainage lines in *Eucalyptus ovata* and *E. obliqua* forest with *Lepidosperma laterale* var. *majus* as an understorey dominant. At Hopkins Falls, *D. callicarpa* occurs on shaded slopes among basalt rocks on sites dominated by *Notelaea ligustrina* and *Hymenanthera dentata*.

All sites mentioned above occur on volcanic geology. At the Halls Gap locality *D. callicarpa* occurs on colluvial sandy loam in highly degraded *E. ovata* riparian forest in heavy shade beside a stream. At the Crib Point site the plant occurs on moist sandy loam, in dense heathy woodland with *Eucalyptus radiata*, *E. ovata* and *E. viminalis* overstorey. Permanent moisture, medium to heavy shade and moderately to highly fertile soils characterise all sites except the stony rise.

The pollinator of *D. callicarpa* has not been observed *in situ*, but an unidentified bee was baited 30 m from the type population in grassy *E. viminalis* woodland outside the *Leptospermum* stand on a cut inflorescence of *D. callicarpa*, and also on a potted flowering plant of *D. amoena* G.W.Carr & P.F.Horsfall. The bee effected buzz pollination (Buchmann 1985) while hanging upside down at the tips of the anthers with its feet clasping the strumae.

## NOTES

*Dianella callicarpa* has previously been identified with the unrelated *D. tasmanica* from which it differs in many floral and vegetative characters. The new species appears to be a member of the poorly resolved *D. caerulea* Sims complex. It is unlike any known taxon of that group (see Henderson 1987) in combined vegetative and floral features and it appears taxonomically isolated.

Plants are only rarely, and then very shortly caulescent, i.e. with aerial stems, (cf. for example *D. caerulea* var. *caerulea*) and hypogeous rhizomes are very short (plants tussock-forming), to quite long. In the latter growth habit it resembles *D. tasmanica*. The very long, lorate, strongly occluded leaves are thin and frequently arching or bent down, especially in situations of heavy shade. Flowers of *D. callicarpa* are very like *D. caerulea* Sims var. *caerulea* in perianth and stamen morphology. The general blue violet coloration of the perianth and often maroon suffusions on the abaxial side of the outer tepals, combined with the deep orange strumae and the pale yellow anther colours, are distinctive. Flowers are weakly fragrant. Fruits are borne in relative abundance. In their brilliant, glossy, deep purple-blue colour the fruits resemble those of many taxa in the *D. caerulea* complex.

*Dianella callicarpa* is easily cultivated and propagated by seed and division. Plants are self fertile and fruit production can be greatly enhanced by artificial endogamous or exogamous pollination. This is accomplished by mimicking buzz pollination (Buchmann 1985) using a tuning fork applied to the anthers to extract pollen, which is then applied to the stigma.

The common name of **Swamp Flax-lily** is suggested in reference to its moist habitat.

***Dianella amoena* G.W.Carr et P.F.Horsfall, *sp. nov.***

A *D. longifolia* R.Br. statura humile, rhizomate angusta ad 30 cm inter caespices, facienti coloniis ad 6 mm diametrum, foliis glaucis angustis tenuibus, plus minusve deciduo-aestivalibus, asperatis valde marginibus et costis, et floribus magnis fragrantissimis malvinis, strumis staminalibus aurantiacis vividis et antheris luteolis differt.

TYPUS: Victoria, Midlands, Nutfield, Victorian plant grid N35, 6 Jan. 1993 *G.W.Carr* 12370 (HOLOTYPE: MEL; ISOTYPE: MEL, HO, NSW, AD, CBG, K.)

Extensively rhizomic, partially to fully summer-deciduous perennial herb to 90 cm high, forming extensive loose mats to 5 m wide; roots fleshy-fibrous, fusiforme, to 4 mm diam; rhizomes slender, yellow (Yellow-Grey Group 11A), to 4 mm diam; shoots to c. 30 cm apart on rhizomes, usually much less. *Leaves* relatively small, lamina narrow linear-lanceolate, long-tapering, to 43 cm long by 4–12 mm wide, thin, broadly V-shaped to nearly flat, prominently keeled abaxially along the midrib; grey-green (nearest Yellow-Green Group 147B), concolourous, and often marked with dull crimson at the base (Red-Purple Group 59D). *Leaf sheaths* loosely clasping, 1/5–2/3 occluded, occlusion zone prominently thickened in cross section; blades, sheaths and midribs with prominent, closely spaced to distant pale brown, antrorse, patent or retrorse outgrowths, ‘teeth’, to 0.5 mm long. *Inflorescences* ± erect, 20–90 cm long, scape relatively slender, usually arching; panicle branching at steep angles, irregularly ovoid-pyramidal, loose and interrupted; cymules 2–5 flowered; pedicels recurved, 3–20 mm long. *Flowers* large, nodding, strongly and sweetly fragrant, opening early to mid-morning, collapsing late afternoon; perianth segments pale to deep blue-violet (abaxial side Blue-Violet Group 96B, 97A), strongly and equally recurved; outer tepals narrow elliptic, sub-acute, 9–9.5 mm long by 2–2.5 mm wide, 5-veined; inner tepals elliptical, shallowly emarginate, 9–9.5 mm long by 3.5 mm wide, 3-veined. *Stamens* 6.5–7 mm long; filaments very pale yellow, 2.5 mm long (straightened), slightly sigmoid in distal 1/3; strumae compressed-obovoid, microscopically papillose, deep orange (Yellow-Orange Group 21A, Orange Group 24A), 2 mm long by 1 mm wide; anthers very narrow-cuneate, pale lime-yellow (Green-Yellow Group 1C, Yellow Group 10A), 3 mm long by 1 mm wide. *Style* whitish-translucent, 6 mm long; ovary green, depressed-globular, 1.5 mm high by 2 mm wide; ovules 6–8 per loculus. *Fruit* globular or obovoid, ultimately shiny off white to dark blue-purple (nearest Violet-Blue Group 90A–90B, Yellow-White Group 158B) 4–7 mm long. Seeds black shiny, smooth, angular-globose, 3 mm long by 2.5 mm wide.

**ETYMOLOGY**

From the Latin *amoenus* — beautiful, pleasing, in reference to the neat habit and the showy, fragrant flowers.



Fig. 2. *Dianella amoena*. a — habit  $\times 0.2$ . b — flower  $\times 2$ . c — outer tepal  $\times 2$ . d — inner tepal  $\times 2$ . e — anther adaxial — abaxial  $\times 4$ . f — fruit  $\times 1$ . g — seed  $\times 4$ . h — section through mid leaf lamina  $\times 4$ . i — cross section mid leaf sheath  $\times 4$ .



## OTHER SPECIMENS EXAMINED

Victoria - Yuroke Creek, Broadmeadows, 15 Dec. 1993, *G.W. Carr* 12815 (MEL). Towards Yea, 12 Dec. 1993, *R.W. Robinson s.n.* (MEL). Mernda, 12 Dec. 1993, *N. van Roosendael s.n.* (MEL). Merri Creek Reserve, 6 Dec. 1992, *G.W. Carr* 12315 (MEL). Headwaters of Darebin Creek, Mernda, 6 Dec. 1992, *N. van Roosendael s.n.* (MEL). Doreen, south of Yan Yean Reservoir, 8 Apr. 1994, *A.M. Muir s.n.* (MEL).

Tasmania — Near Cascade Brewery, Hobart, 23 Jul. 1892, *L. Rodway s.n.* (HO 84352); Barracks, Anglesea (Hobart), Dec. 1891, *L. Rodway s.n.* (HO 84349); South Esk, no date, *W.H. Archer s.n.* (NSW 149262); Penuite, 22 Jan. 1842, *R. Gunn* 1837 (NSW 149263).

## DISTRIBUTION AND CONSERVATION STATUS

*Dianella amoena* is found in Victoria (Midlands, Volcanic Plains and Gippsland Plain of Conn (1993)) and Tasmania, but in both states it is very poorly collected and undoubtedly rare given the status of grassland and grassy woodland vegetation (Scarlet and Parsons 1993, Frood and Calder 1987). Recent surveys of grassy woodland and grassland, mostly in the Melbourne region, Victoria, have revealed 13 populations. In these studies *D. amoena* has been called *D. sp. nov.* (Nutfield). The following localities have been recorded by recent workers: Merri Creek (McMahon and Schulz 1993), La Trobe Valley (Carr *et al.* 1992), Broadmeadows (Carr *et al.* 1993, McMahon and Peake 1994), Doreen (Muir *et al.* 1994), Eltham (Bedgood *et al.* 1994). Four old collections are known from Tasmania, but the species may occur on roadsides in the Midlands (D. Morris, pers. comm.). All known populations are very small (5 populations of 1 plant only) and the largest contains about 5 plants.

Recruitment is believed to be non-existent. Populations are clearly fragments of much larger populations that have persisted in highly degraded vegetation. Most sites are extremely weedy (see quadrat data in above references) and stock grazing and mowing occurs in some. The conservation code according to criteria of Briggs and Leigh (1989) is 3E, with a range exceeding 100 km, endangered, and unrepresented in conservation reserves.

## HABITAT AND ECOLOGY

*Dianella amoena* is a plant of lowland grassland and grassy woodland on very well drained to seasonally waterlogged fertile sandy loams to heavy cracking clays. In Victoria soils are derived from Silurian and Tertiary sediments, or (most sites) volcanic geology.

While vegetation at all sites seen by us (except the type locality) is grossly degraded, it is possible to reconstruct eucalypt dominants, viz. *Eucalyptus pauciflora* ssp. *pauciflora* (LaTrobe Valley), *E. ovata* and *E. camaldulensis* (Epping), *E. camaldulensis* (Mernda, Bundoora), *E. melliodora* and *E. gonicalyx* (type locality) and *E. gonicalyx*, *E. polyanthemus* ssp. *vestita* and *E. macrorhyncha* ssp. *macrorhyncha* (Eltham). On basalt escarpments (Coburg, Merri Creek) eucalypts may have been absent.

At all sites grasses dominate the field layer. Excluding the abundant or dominant exotics (such as *Holcus*, *Paspalum*, *Agrostis*) these are *Themeda triandra* (common to all sites), *Microleana stipoides*, and *Danthonia* spp. Quadrat data (held at the Flora and Fauna Branch, Department of Conservation and Natural Resources) for the sites containing *Dianella amoena* are given in the references cited above.

## NOTES

*Dianella amoena* is unusual in its combined morphological features. It has long, very slender, wiry and much-branched rhizomes and narrow, tapering and thin lax or stiff leaves that are summer deciduous when water stressed. Leaves are also partially to fully occluded and thickened in the occlusion zone and have closely spaced to distant,  $\pm$  patent asperities (peg like projections or teeth) on the leaf midrib and margins. The relatively few-flowered panicles are often small. Flowers are large (upper size range in *Dianella*), colourful and highly fragrant. Plants are often very floriferous and the species is rather late flowering. The stamens are large and showy with bright orange strumae. Fruits are small, few-seeded and rather dull.

*Dianella amoena* has no close relatives among species from Victoria, South Australia and Tasmania, and it does not belong with the *D. caerulea* Sims, *D. revoluta* R.Br., *D. longifolia* R.Br. or *D. tasmanica* J.D.Hook. groups (see Henderson 1987) which otherwise constitute the bulk of the *Dianella* flora of Australia. The only Herbarium material (from Hobart) at HO and NSW collected before our study was determined as *D. tasmanica* or *D. caerulea* var. *caerulea*, from both of which it is taxonomically distant.

At several sites *D. amoena* is sympatric with *D. revoluta* R.Br. var. *revoluta* and *D. longifolia* R.Br. var. *longifolia* or *D. longifolia* R.Br. var. *grandis* R.Henderson (*sensu* Conran 1994), and flowering times overlap for these taxa.

Buzz pollination (see note under *D. callicarpa*) at the type locality has been observed to be effected by 2 unidentified bee species, at least one of which also pollinates *D. longifolia* var. *longifolia* (*sensu* Ross 1993 and Conran 1994). This same bee species has been baited to flowers of a container-grown *D. amoena* at Hurstbridge near the type locality. At Branholme another bee species visited *D. amoena* flowers and those of *D. callicarpa* (see note under later species). Bees approached inflorescences or clumps of inflorescences from downwind, scribing a zigzag path and actively worked flowers for pollen in the behaviour described under *D. callicarpa* (above).

The common name of **Matted Flax-lily** is proposed in reference to the extensively rhizomatous habit of *D. amoena*.

***Dianella tarda*** P.F.Horsfall et G.W.Carr, *sp. nov.*

*D. longifoliae* R.Br. complexae pertinenti, habitu robusto et caespitoso arcte, foliis angustis crassiusculis glaucis canaliculatis valde, ad 160 cm longis, 17 mm latis, inflorescentia elata multiflora obovoida anguste vel ellipsoidea et floribus parvis fragrantissimis aperientibus serotinissimis et collabentibus serotini pariter distinguitur.

TYPUS: Victoria, Riverina, Strathmerton, Victorian plant grid M9, 8 Jan. 1993 P.F.Horsfall 396 (HOLOTYPE: MEL; ISOTYPE: MEL, AD, NSW, BRI, K).

Robust, densely caespitose perennial herb to 2 m high, forming clumps to 20 cm wide at the base; roots fleshy, long-fusiforme, to 90 cm long and 7–9 mm diam; rhizomes between shoots to 70 mm long; stems of shoots to 20 mm long and 7–9 mm diam. *Leaves* 35–160 cm long by 8–17 mm wide, linear-attenuate, coriaceous-fleshy, lamina moderately to strongly V-shaped in section, dark grey-green and sub-glaucous (nearest yellow-green Group 147A), margins smooth, midrib minutely scabrid near leaf tip; leaf sheaths loosely embracing, U-shaped, not or only slightly occluded, slightly keeled or rounded abaxially. *Inflorescence* robust, to 2 m high, scape rigidly erect; panicle narrowly obovoid in outline, somewhat interrupted below, dense above, branching at steep angles; cymes 2–18 flowered, closely spaced; pedicels 4–22 mm long, very slender, strongly recurved. *Flowers* nodding, relatively small with strong Dianthus-like fragrance, opening between 1–4 pm, collapsing between 8–10 pm; perianth very pale blue (Violet-Blue Group 97A); outer tepals narrow-elliptic, 7 mm long by 3 mm wide, 5-veined; inner tepals ovate-elliptic, 6.5 mm long by 2.5 mm wide, 3-veined. *Stamens* 7–9 mm long; filaments 2–3 mm long, strongly sigmoid in upper half; strumae rich yellow (nearest Yellow Group 9A), obovoid-globose, microscopically papillose, 1.5 mm long by 1 mm wide; anthers pale lemon-yellow (Yellow Group 4A), narrowly linear-cuneate, 4 mm long by 1 mm wide; style pale blue-violet (Violet-Blue Group 94D), 5–6.5 mm long; ovary ± globose but distinctly 3-lobed, 1.5 mm high by 1.5 mm wide, green (Yellow-Green Group 144D); ovules 5 per loculus; *Fruit* china blue or uncommonly white (Violet Blue Group 89A), irregularly globose, 3–10 mm long by 3–9 mm wide. *Seeds* lenticular-globose or angular-globose, smooth 2.5–3.5 mm long by 1.75–2 mm wide, black, very shiny.

#### ETYMOLOGY

From the Latin *tardus*-late, in reference to the very late time of flower opening (early-mid afternoon) and correspondingly late flower collapsing (evening).



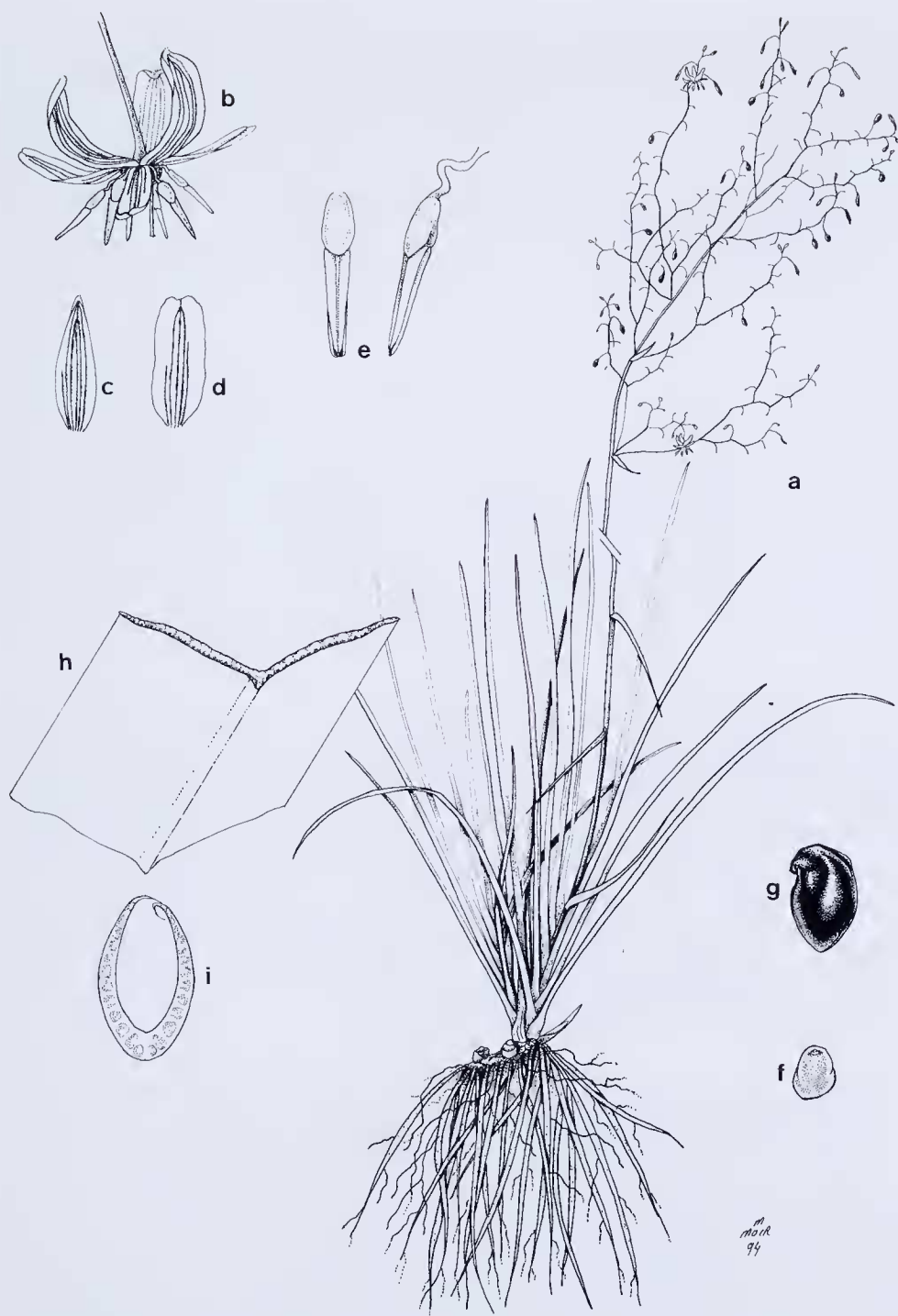


Fig. 3. *Dianella tarda*. a — habit  $\times 0.13$ . b — flower  $\times 2$ . c — outer tepal  $\times 2$ . d — inner tepal  $\times 2$ . e — anther adaxial — abaxial  $\times 4$ . f — fruit  $\times 1$ . g — seed  $\times 4$ . h — section through mid leaf lamina  $\times 4$ . i — cross section lower leaf sheath  $\times 4$ .

## OTHER SPECIMENS EXAMINED

Victoria - 5km NW of Strathmerton 29 Dec. 1993, *P.F.Horsfall* (MEL). Broken Creek 5–8 km NW of Nathalia 29 Dec. 1993 *P.F.Horsfall* (MEL). Hume Highway near Creighton Creek, 23 Jan. 1988, *A.C.Beauglehole* 92784 (MEL 1606234). Tocumwal Regional Park, 17 Nov. 1985, *A.C.Beauglehole* 82142 (MEL 684583). Runnymede Flora Reserve, 3 Nov. 1981, *A.C.Beauglehole* 69769 (MEL 1595718). Mt Mcg Flora and Fauna Reserve, 7 Nov. 1985, *A.C.Beauglehole* 81458 (MEL 684836). Lake Powell  $\pm$  16 km SE of Robinvale P.O., Mallee Study Area (F39), 3 May 1977, *A.C.Beauglehole* 56113 (MEL 1515724). Far NW Hattah Lakes National Park, 10 Sep. 1960, *A.C.Beauglehole* 39298 (MEL 534244).

New South Wales — Near Karoola-Grenfell, Jan. 1974, *G.M.Cunningham and P.S.Millthorpe* 1972 (NSW).

## DISTRIBUTION AND CONSERVATION STATUS

*Dianella tarda* has a much depleted and fragmented distribution on the northern plains of Victoria, in the Riverina and the Midlands. Natural Regions of Conn (1993), but few collections have been made. It is likely to occur in the South Western Plains, South West Slopes and Central Western Slopes of New South Wales (Harden 1991), but has only been definitely recorded for the latter as (*D. longifolia* R.Br. *sens. lat.*). However most material in NSW is too difficult to identify with confidence, but some specimens from the above-mentioned regions are probably *D. tarda*.

The conservation status is assumed to be depleted in the sense of Gullan *et al.* (1990), as the rare populations in Victoria are small and threatened by weed invasions (especially exotic grasses). Recruitment is assumed to be rare or non-existent, judged by the age structure of the populations that we have observed in Victoria.

## HABITAT AND ECOLOGY

In Victoria *Dianella tarda* is a plant of heavy clays, clay loams and sandy loams, mostly on Quaternary fluvial plains on high alluvium or alluvial terraces. Rainfall is within the 400–500mm isohyets. Vegetation at the populations observed and from herbarium labels indicates that the species has a preference for grassy *Eucalyptus camaldulensis* riparian flood plain forest. Other vegetation in which this species has been recorded, as *D. sp. nov.* (Riverina), include grassy woodland or forest dominated by *E. camaldulensis*, *E. melliodora* and *E. goniocalyx* (Bedgood and Peake 1993, Peake *et al.* 1993).

Pollinators are assumed to be attracted by the strong *Dianthus*-like fragrance but have not been observed. These are most probably bees effecting buzz pollination, see notes on *D. amoena* and *D. callicarpa* above. The lateness of the flowering time suggests temporal avoidance of competition with other plant species for pollinators e.g., the sympatric *D. revoluta* R.Br. var. *revoluta*.

## NOTES

*Dianella tarda* is a member of the *D. longifolia* R.Br. complex (Henderson 1987) and is most closely related in Victoria to *D. longifolia* var. *longifolia* (*sensu* Conran 1994) and *D. porracea* (R.Henderson) P.F.Horsfall and G.W.Carr.

It is distinct from these taxa in a combination of vegetative and floral features and in distribution. Plants are robust, evergreen and densely tussock-forming, with narrow,  $\pm$  smooth, erect, moderately glaucous, deeply channelled,  $\pm$  fleshy leaves; inflorescences are usually tall,  $\pm$  obovoid to elliptical in outline with sprawling, elongated panicles. The size of flowers are at the small end of the range for the southern species in the *D. longifolia* complex. Flowers have a strong fragrance very similar to *Dianthus caryophyllus* (garden carnation), reminiscent of cloves, in common with *D. porracea*.

In its diurnal anthesis-pattern, flowers open later than any of the other *Dianella* for which we have data. In summer flowers commence opening between 1–4 pm and collapse correspondingly late, between 8–10 pm. Flowers of most *Dianella* taxa open in the morning and collapse in mid to late afternoon.

The perianth segments of *D. tarda* are rather narrow, consistently pale blue and strongly reflexed. The colour, size, shape and proportions of the strumae and anthers are distinctive.

The common name, **Late-flowered Flax-lily** is proposed, in reference to the flowering time.

***Dianella brevicaulis*** (Ostenf.) G.W.Carr et P.F.Horsfall. *comb. et stat. nov.*

**BASEONYM:** *Dianella revoluta* R.Br. var. *brevicaulis* Ostenf., *Det Kgl. Danske Vidensk. Selsk. Biol. Meddel.* 3 (2): 24, t. 1, fig. 1 (1921). **LECTOTYPUS:** C (right-hand piece) *fide* Henderson, *Fl. Aust.* 45: 483 (1987). (**LECTOTYPUS n.v.**). *Dianella revoluta* R.Br. f. *pygmaea* Schlittler, *Mitt. Bot. Mus. Univ. Zurich* 163: 272 (1940). **LECTOTYPUS:** Mt Direction, Tasmania, 5 Dec. 1921, R.A.Black, *fide* Henderson *Fl. Aust.* 45: 485 (1987)(n.v.).

**ILLUSTRATIONS:** Ostenfeld *op. cit.*, Curtis (1952).

#### REPRESENTATIVE SPECIMENS EXAMINED

*Victoria* — Point Addis, near Anglesea, exposed coastal heath (P20), 1986/87, *M.D.White* 2 (MEL 690475). Melbourne, Royal Melbourne Golf Course, Cheltenham Rd, Black Rock, (N52), 27 Oct. 1987, *I.C.Clark* 2052 (MEL 588772). Cape Nelson, c. 700m E of the lighthouse (E22), 3 Dec. 1992, *D.E.Albrecht* 5179 (MEL 2017297). Little Desert National Park, 0.2km W of S end of old Nhill track, on Boundary Track, 18 Dec. 1983, *G.W.Carr* 7701 (MEL 1554308).

*Tasmania* - 5 km E of South Arm, 4 Nov. 1967, *J.H.Hemsley* 6331 (NSW).

*South Australia* - Coffin Bay National Park, Eyre Peninsula, 24 Oct. 1988, *P.H.Venow* 927 (NSW). Kingscote, Jan. 1907, *J.H.Maiden* (NSW 149149).

*Western Australia* - 67 km S of Nanambina Station, S of Belladonia, 24 Oct. 1963, *T.E.H.Aplin* 2580 (NSW). Irwins Inlet, 24 Dec. 1912, *Colby* and *S.W.Jackson* (NSW 149164).

#### NOTES

*Dianella brevicaulis* is abundantly distinct from *D. revoluta* R.Br. var. *revoluta* (*sensu* Henderson 1987) as recognised by Curtis (1952) and it is surprising that the species has so long retained varietal rank. Henderson (1987) noted that the taxon may warrant higher rank upon further study. In rhizome architecture, leaf, floral characters and broad distribution it is easily distinguished, as seen in the comparison with *D. revoluta* var. *revoluta* (Table 1). Plants of *D. brevicaulis* commonly occur with *D. revoluta* var. *revoluta* as understood by Henderson (1987) and Conran (1994), and with a previously unrecognised coastal taxon belonging to the *D. revoluta* complex (Carr & Horsfall unpublished data), but intermediates have not been recorded.

***Dianella porracea*** (R.Henderson) P.F.Horsfall et G.W.Carr. *comb. et. stat. nov.*

**BASEONYM:** *Dianella longifolia* R.Br. var. *porracea* R.Henderson, *Fl. Aust.* 45: 481 (1987). **TYPUS:** c. 28km W of Cunnamulla on road to Eulo, Queensland, 9 Oct. 1977, R.Henderson 2576 (**HOLOTYPE:** BRI n.v.).

**ILLUSTRATIONS:** G.M.Cunningham *et al.*, Pl. W. New South Wales, 184 (1982); R.J.Henderson *op. cit.* fig. 68E, 221 (1987).

#### REPRESENTATIVE SPECIMENS EXAMINED

*Victoria* - Lake Powell, ± 16 km SE of Robinvale P.O., Mallee Study Area (F39), 3 May 1977, *A.C.Beaglehole* 56113 (MEL 1515724). Hattah Lakes National Park, 10 Sep. 1960, *A.C.Beaglehole* 39298 (MEL 534244).

*New South Wales* — c. 2 km E of Minetta, 6 Nov. 1971, *A.Rodd* 1918 (NSW). Lighting Ridge, 5 Nov. 1987, *D.I.Wilson* & *P.G.Wilson* s.n.(NSW). Between Euston and Gol Gol, 15 Oct. 1949, *J.Vickery* s.n.(NSW 149256). Homestead Gorge, Mootwingee National Park, 22 Oct. 1988, *I.Crawford* 1094 (NSW, BRI).

*Queensland*. 28km W of Cunnamulla on road to Eulo, 9 Oct. 1977, *R.J.Henderson* II 25769 (NSW)

#### NOTES

Henderson (1987) suggested that his taxon may warrant elevation to subspecific or specific status on further study. *Dianella porracea* is abundantly distinct from other



Table 1. Comparison of *Dianella brevicaulis* and *D. revoluta* var. *revoluta* (mostly based on Victorian material).

Character	<i>Dianella brevicaulis</i>	<i>Dianella revoluta</i> var. <i>revoluta</i>
Distribution	Coastal Victoria, Tasmania, South Australia and Western Australia (restricted distribution inland)	Very widespread, inland Vic., Tas., S.A., W.A., N.S.W. and Qld. Unusually coastal in Vic.
Habit	Very densely tussock forming, plants to 25 cm at base, occasionally (S.A.) shortly rhizomic to c. 1 m wide	Extensively rhizomic, plants to 10 m wide.
Rhizomes	Very short, usually <10 mm, occasionally to 15 cm long and 3 mm diameter	Up to 50 cm long, 6 mm diameter
Leaves	To 100 cm long $\times$ 5–7 mm wide, margins revolute; leaves non-glaucous	To 110 cm long $\times$ 8–12 mm wide, margins revolute, leaves glaucous
Inflorescence	Very short and dense, 11–35 cm long, seldom exceeding half the length of the leaves and always within the tussocks	To 80 cm long, open to very open and usually exceeding the leaves; outside the tussocks
Cymules	3–13 flowered	2–9 flowered
Pedicels	3–8 mm long	3–29 mm long
Flowers	Very small to small	Medium sized
Perianth	Pale to deep blue, rarely white	Deep blue
Outer tepals	5–6.5 mm long $\times$ 2–2.25 mm wide	6.5–11 mm long $\times$ 2.5–3.5 mm wide
Inner tepals	4.5–6 mm $\times$ 3–4 mm wide	6–9 mm long $\times$ 3.5–4.5 mm wide
Filaments	0.7–2 mm long	1–1.5 mm long
Strumae	0.5 mm long $\times$ 0.4 mm wide	0.75–1 mm long $\times$ 0.5–0.8 mm wide
Anther	2–2.5 mm long $\times$ 0.8 mm wide	2–4 mm long $\times$ 0.75–1.25 mm wide
Style	3–4 mm long	4–6 mm long
Ovary	1 mm high $\times$ 1.5–2 mm diam.	1.5 mm high $\times$ 1.75 mm diam.
Ovules	4 per loculus	8 per loculus
Fruit	Globular to obovoid or irregularly shaped, dull purple-blue, rarely greenish white or white, 3–6 mm long $\times$ 4–6 mm wide	Depressed globular or globular, 5–11 mm long $\times$ 5–10 mm wide, very dark purplish-blue
Seed	Black, very glossy, $\pm$ ovoid-lenticular or angular, 3 mm long $\times$ 1.75 mm wide	Black, very glossy, $\pm$ ovoid-lenticular or angular, 3.5 mm long $\times$ 2.75 mm wide
Flower time	August to December	August to January
Pollination	Effected by native bees c. 4.5 mm long	Effected by native bees 6–7 mm long
Chromosome number	$2n = 16$ (fide Curtis 1952)	$2n = 16, 32, 48$ (fide Henderson 1987)

members of the *D. longifolia* complex in a combination of vegetative and floral features, distribution and ecology. It is most distinct vegetatively in leaf characters: leaves are smooth, broad,  $\pm$  flat, rather soft and fleshy, distinctively ribbed and strongly recurved or arcuate, and summer deciduous unlike all members of the *D. longifolia* complex we know. It is not possible to present a table comparing *D. porracea* with *D. longifolia* var *longifolia* or other varieties in the group, as they are currently poorly circumscribed and require further study. As in all functionally deciduous drought-avoiding *Dianella* (see

*D. amoena* above), the leaves persist where summer conditions allow. The species is capable of surviving for several months with its roots inundated, and in its natural habitat of riparian forest, where plants are subject to flooding, the leaves die back to the fleshy tuberous roots until more favourable conditions allow regrowth. Populations of *Dianella porracea* that have been observed along Gunbower Parade at Koondrook in northern Victoria, grow with *Dianella revoluta* var. *revoluta*. Plants have also been observed in the Gutteram Swamp NW of Koondrook, and SW of Boort; currently the most southern population known to us. In N.S.W., plants have been observed growing along Barber Creek just NE of Barham and on an anabranch of Eagle Creek just N of Barham. At all sites, plants have been growing in *E. camaldulensis* grassy woodland on grey cracking gilgai clays subject to inundation, and except for the Boort plants, generally tend to grow alongside riverbanks.

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